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PROBLEMS FOR SOLUTION.

ARITHMETIC.

114. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

Does it pay a $4-carpenter using a dozen four-penny nails per minute, to pick up a dropped nail? At this rate, should twenty-penny nails be picked up?

115. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Physics, Decorah Institute, Decorah, Ia.

Where shall a pole 120 feet high be broken so that the top may rest on the ground 40 feet from the foot? (Solve by arithmetic.)

⁂ Solutions of these problems should be sent to B. F. Finkel not later than August 10.

ALGEBRA.

102. Proposed by J. MARCUS BOORMAN, Woodmere, N. Y.

Solve $2x+\sqrt{(x^2-7)}=5$. [See *Hind's Algebra*, page 447.]

103. Proposed by WALTER H. DRANE, Graduate Student, Harvard University. Cambridge, Mass.

Given the equation $x^m+p_1x^{m-1}+p_2x^{m-2}+\ldots\ldots p_{m+1}x+p_m=0$ freed from multiple roots. Prove that its discriminant is positive or negative according as the number of pairs of complex roots is even or odd.

⁂ Solutions of these problems should be sent to J. M. Colaw not later than August 10.

104. Prize Problem. $2.50 for the best solution.

Compute to three decimal places each of the roots of the equation $x^2+y=2$, $x+y^2=6$.

⁂ Solutions of this problem should be sent to B. F. Finkel not later than September 1.

GEOMETRY.

123. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Physics, Decorah Institute, Decorah, Ia.

A étant le point d' intersection des médianes d' un triangle ABC, démontrerque $AB^2+BC^2+CA^2=3(GA^2+GB^2+GC^2)$. [Ex. 84, Géométrie. No. 2, 1re Anne *L' Éducation Mathématique.*]

⁂ Solutions of this problem should be sent to B. F. Finkel not later than August 10.

CALCULUS.

92. Proposed by B. F. SINE, Principal of Capon Bridge Normal School, Capon Bridge, W. Va.

How much wood is taken from a log 12 inches in diameter, by boring a two-inch hole through the center, the axis of hole being perpendicular to axis of log?

93. Proposed by JOHN R. JEFFREY, Student in Ohio State University, Columbus, Ohio.

Solve the following differential equation :

$$(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=2x, \text{ when } x<1.$$

94. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Physics, Decorah Institute, Decorah, Ia.

Find the minimum isosceles triangle that can be described about a given ellipse, having its base parallel to the major axis. [Ex. 16, page 166, *Rice and Johnson's Differential Calculus.*

*** Solutions of these problems should be sent to J. M. Colaw not later than August 10.

MECHANICS.

91. Proposed by CHARLES C. CROSS, Whaleyville, Va.

The bow of a boat which is a inches wide is inclined at an angle α. When in motion in perfectly calm water the water was found to rise b inches on the bow. Required the velocity of the boat.

92. Proposed by WALTER H. DRANE, Graduate Student, Harvard University, Cambridge, Mass.

A particle, starting at the vertex, slides down a smooth parabolic curve. Prove that in order to leave the curve at the extremity of the latus rectum, the initial velocity of the particle must be $pg[\sqrt{2}-1]$ where p is semi-latus rectum.

*** Solutions of these problems should be sent to B. F. Finkel not later than August 10.

AVERAGE AND PROBABILITY.

75. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

Find the mean area of all plane rectilineal right triangles having a constant perimeter p.

76. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

In a given ellipse, the extremities of a focal chord are joined with the center. Find the average area of the triangle thus formed.

*** Solutions of these problems should be sent to B. F. Finkel not later than August 10.

MISCELLANEOUS.

79. Proposed by S. HART WRIGHT, A. M., Ph. D., Penn Yan, N. Y.

In latitude 42° 30′ N.$=\lambda$, a tree 100 feet long$=\alpha$, leans in the direction S. 60° W.$=\beta$, with an angle of elevation with the level ground, of 30°$=\gamma$. The sun's declination being 1° 36′ 24″ N.$=\delta$, in what direction will the shadow of the tree point, when the sun is on the meridian ?